

SILICON POWER TRANSISTOR

NEL2035F03-24

NPN SILICON EPITAXIAL TRANSISTOR

L Band Power Amplifier

DESCRIPTION AND APPLICATIONS

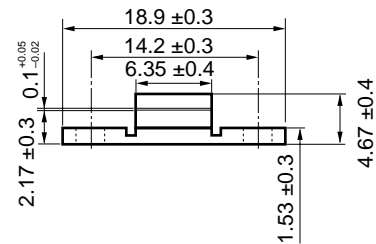
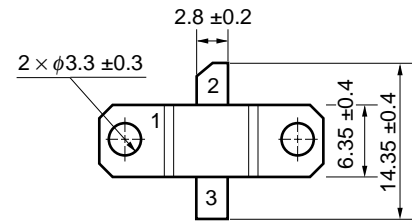
NEL2035F03-24 of NPN epitaxial microwave power transistors is designed for 1.8-2 GHz PHS/PCN/PCS base station applications.

It incorporates emitter ballast resistors, gold metallizations and offers a high degree of reliability.

FEATURES

- High Linear Power and Gain
- Low Internal Modulation Distortion
- High Reliability Gold Metallization
- Emitter Ballasting
- 24 V Operation

OUTLINE DIMENSIONS (Unit: mm)



1 - EMITTER
2 - BASE
3 - COLLECTOR

ABSOLUTE MAXIMUM RATING ($T_A = 25\text{ }^{\circ}\text{C}$)

PARAMETER	SYMBOL	SPECIFIED CONDITION	RATINGS	UNIT
Collector to Base Voltage	V_{CBO}		45	V
Collector to Emitter Voltage	V_{CER}	$R = 10\ \Omega$	30	V
Emitter to Base Voltage	V_{EBO}		3	V
Collector to Emitter Voltage	V_{CEO}		18	V
Collector Current	I_C		14	A
Power Dissipation	P_T		79.5	W
Thermal Resistance	$R_{th(j-c)}$		2.2	$^{\circ}\text{C/W}$
Junction Temperature	T_j		200	$^{\circ}\text{C}$
Storage Temperature	T_{stg}		-65 to 150	$^{\circ}\text{C}$

ELECTRICAL CHARACTERISTICS (T_A = 25 °C)

PARAMETER	SYMBOL	SPECIFIED CONDITION	MIN.	TYP.	MAX.	UNIT
Collector to Emitter Cutoff Current	I _{CES}	V _{CE} = 24 V			10	mA
Collector to Emitter Voltage (Base to Emitter Resistor = 10 Ω)	V _{CER}	I _C = 20 mA, R = 10 Ω	30	85		V
Collector to Emitter Voltage (Open Base)	V _{CEO}	I _C = 20 mA	18	22		V
Collector to Base Voltage (Open Emitter)	V _{CBO}	I _C = 20 mA	45	85		V
Emitter to Base Voltage (Open Collector)	V _{EBO}	I _C = 25 mA	3	5.3		V
DC Forward Current Gain	h _{FE}	V _{CE} = 5 V, I _C = 1 A	30	100	150	
Output Capacitance	C _{ob}	V _{CE} = 24 V, f = 1 MHz		189		pF

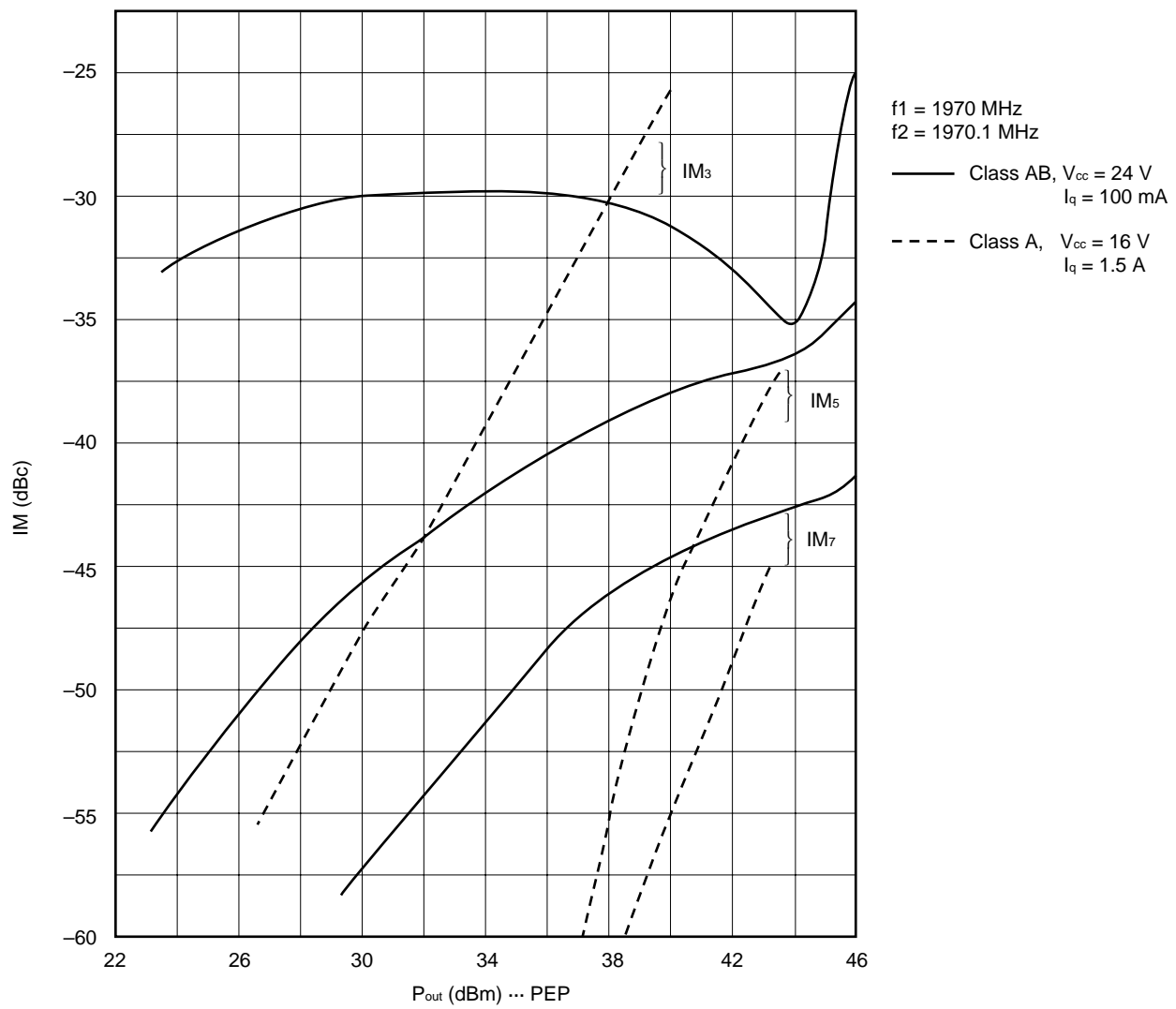
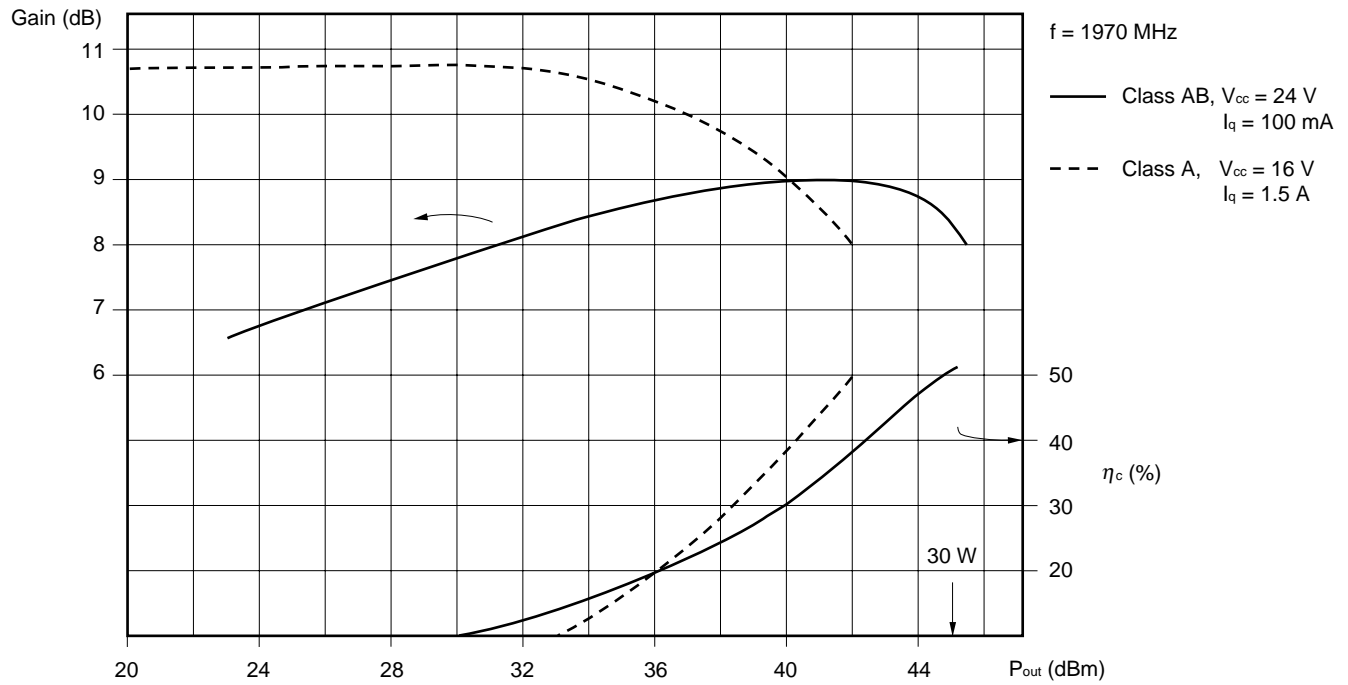
PERFORMANCE SPECIFICATIONS ($T_A = 25\text{ }^{\circ}\text{C}$)

CLASS AB OPERATION

PARAMETER	SYMBOL	SPECIFIED CONDITION	MIN.	TYP.	MAX.	UNIT
Output Power	P_{ldB}	$f = 1.97\text{ GHz}$, $I_q = 100\text{ mA}$, $V_{\text{CC}} = 24\text{ V}$, CLASS AB	30	33		W
Collector Efficiency	η_c	$f = 1.97\text{ GHz}$, $P_{\text{out}} = P_{\text{ldB}}$, $I_q = 100\text{ mA}$, $V_{\text{CC}} = 24\text{ V}$, CLASS AB	40	50		%
Linear Gain	GL	$f = 1.97\text{ GHz}$, $P_{\text{in}} = 2\text{ W}$, $I_q = 100\text{ mA}$, $V_{\text{CC}} = 24\text{ V}$, CLASS AB		9		dB
3rd Order Intermodulation	IM_3	$f = 1.97\text{ GHz}$, $\Delta f = 100\text{ kHz}$, 30 W PEP, $V_{\text{CC}} = 24\text{ V}$, $I_q = 100\text{ mA}$, CLASS AB		-33		dBc

CLASS A OPERATION

PARAMETER	SYMBOL	SPECIFIED CONDITION	MIN.	TYP.	MAX.	UNIT
Output Power	P_{ldB}	$f = 1.97\text{ GHz}$, $I_q = 1.5\text{ A}$, $V_{\text{CC}} = 16\text{ V}$, CLASS A		7		W
Collector Efficiency	η_c	$f = 1.97\text{ GHz}$, $P_{\text{out}} = P_{\text{ldB}}$, $I_q = 1.5\text{ A}$, $V_{\text{CC}} = 16\text{ V}$, CLASS A		30		%
Linear Gain	GL	$f = 1.97\text{ GHz}$, $P_{\text{in}} = 0.1\text{ W}$, $I_q = 1.5\text{ A}$, $V_{\text{CC}} = 16\text{ V}$, CLASS A		10.7		dB
3rd Order Intermodulation	IM_3	$f = 1.97\text{ GHz}$, $\Delta f = 100\text{ kHz}$, 5 W PEP, $V_{\text{CC}} = 16\text{ V}$, $I_q = 1.5\text{ A}$, CLASS A		-33		dBc



S-PARAMETER

NEL2035 Class A

 $V_{CC} = 16\text{ V}$, $I_{CQ} = 1.5\text{ A}$

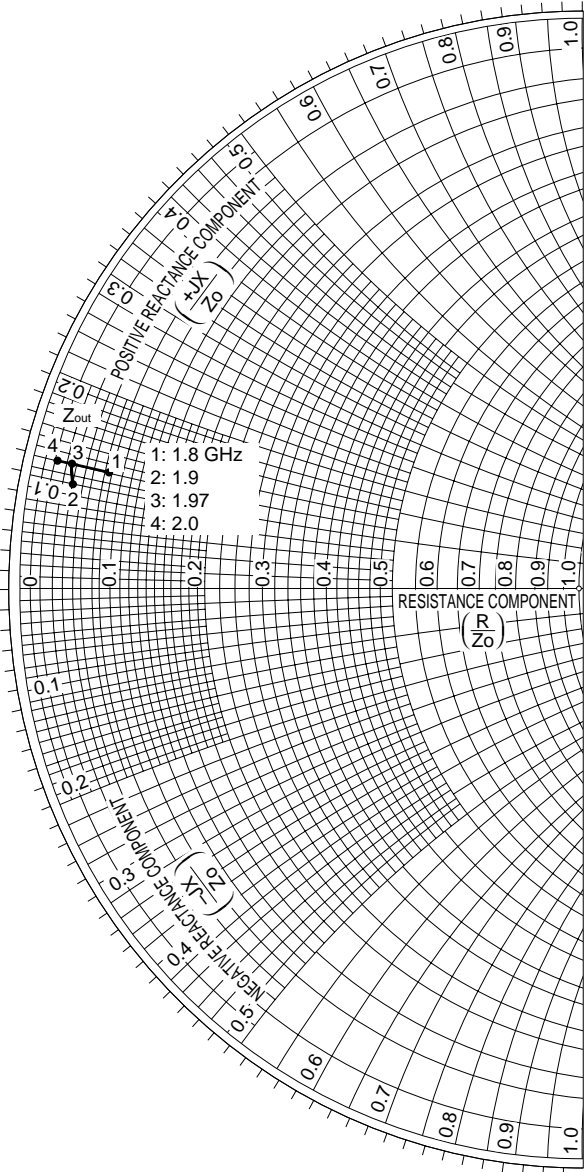
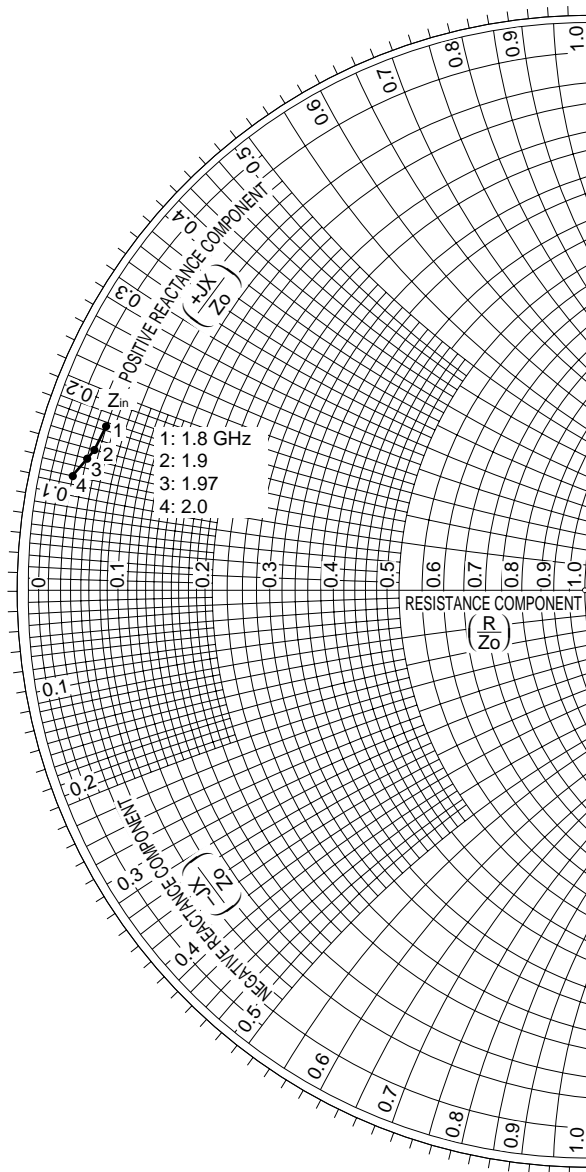
FREQUENCY GHz	MAG	S ₁₁ ANG (DEG)	MAG	S ₁₂ ANG (DEG)	MAG	S ₂₁ ANG (DEG)	MAG	S ₂₂ ANG (DEG)
1.70	0.98	165	0.04	48	0.42	73	0.92	160
1.71	0.98	165	0.04	47	0.44	71	0.91	160
1.72	0.98	165	0.04	47	0.47	68	0.90	160
1.73	0.97	164	0.04	45	0.49	65	0.89	160
1.74	0.97	164	0.04	43	0.51	62	0.88	160
1.75	0.96	164	0.04	40	0.54	59	0.87	160
1.76	0.95	163	0.04	37	0.57	57	0.86	160
1.77	0.94	163	0.04	33	0.61	53	0.85	160
1.78	0.93	163	0.04	29	0.65	48	0.84	161
1.79	0.92	162	0.04	25	0.69	43	0.82	161
1.80	0.90	162	0.04	21	0.71	37	0.81	162
1.81	0.89	162	0.05	15	0.74	32	0.80	163
1.82	0.87	163	0.05	10	0.78	26	0.79	165
1.83	0.86	163	0.05	-1	0.81	19	0.79	166
1.84	0.85	164	0.04	-8	0.83	11	0.79	168
1.85	0.84	165	0.04	-14	0.84	3	0.80	170
1.86	0.83	167	0.04	-15	0.81	-5	0.82	171
1.87	0.84	168	0.03	-20	0.78	-11	0.84	172
1.88	0.84	169	0.03	-25	0.75	-18	0.87	172
1.89	0.85	170	0.03	-28	0.72	-24	0.89	172
1.90	0.86	171	0.02	-33	0.69	-30	0.91	172
1.91	0.87	171	0.02	-36	0.65	-36	0.93	172
1.92	0.89	171	0.01	-38	0.60	-42	0.94	171
1.93	0.90	171	0.01	-34	0.55	-46	0.95	171
1.94	0.90	171	0.01	-26	0.51	-49	0.96	170
1.95	0.91	171	0.01	-21	0.49	-51	0.97	169
1.96	0.92	171	0.01	-13	0.46	-55	0.97	169
1.97	0.93	171	0.01	-1	0.43	-58	0.98	168
1.98	0.93	171	0.01	16	0.40	-61	0.98	168
1.99	0.94	171	0.01	30	0.37	-63	0.98	167
2.00	0.94	171	0.01	38	0.35	-65	0.99	167

NEL2035 Class AB

 $V_{CC} = 24\text{ V}$, $I_{CQ} = 0.1\text{ A}$

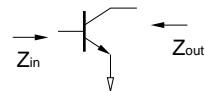
FREQUENCY GHz	MAG	S ₁₁ ANG (DEG)	MAG	S ₁₂ ANG (DEG)	MAG	S ₂₁ ANG (DEG)	MAG	S ₂₂ ANG (DEG)
1.70	0.98	167	0.04	68	0.20	90	0.95	156
1.71	0.98	167	0.04	65	0.22	88	0.95	155
1.72	0.98	167	0.04	63	0.23	86	0.94	155
1.73	0.98	166	0.04	61	0.25	84	0.93	154
1.74	0.98	166	0.04	60	0.26	82	0.92	154
1.75	0.97	166	0.05	59	0.28	80	0.92	153
1.76	0.97	166	0.05	56	0.30	79	0.90	152
1.77	0.97	165	0.05	53	0.33	76	0.89	151
1.78	0.97	165	0.05	51	0.36	72	0.87	150
1.79	0.96	165	0.06	48	0.38	68	0.85	149
1.80	0.96	164	0.06	45	0.42	65	0.82	147
1.81	0.95	164	0.07	41	0.45	60	0.78	146
1.82	0.94	164	0.07	35	0.51	55	0.74	145
1.83	0.93	164	0.08	31	0.56	49	0.68	144
1.84	0.92	163	0.08	23	0.62	41	0.62	145
1.85	0.90	163	0.08	15	0.67	32	0.55	148
1.86	0.88	164	0.08	4	0.71	21	0.49	155
1.87	0.87	165	0.08	-7	0.73	10	0.47	165
1.88	0.86	166	0.08	-18	0.74	-1	0.49	56
1.89	0.86	167	0.07	-29	0.72	-13	0.56	-56
1.90	0.87	169	0.06	-39	0.68	-23	0.64	-173
1.91	0.88	169	0.05	-48	0.63	-33	0.72	-173
1.92	0.89	170	0.05	-56	0.57	-42	0.78	-174
1.93	0.90	170	0.04	-62	0.51	-49	0.83	-176
1.94	0.91	170	0.03	-67	0.46	-54	0.86	-58
1.95	0.92	170	0.03	-71	0.42	-58	0.89	60
1.96	0.93	170	0.02	-74	0.39	-63	0.91	178
1.97	0.93	170	0.02	-77	0.35	-67	0.92	177
1.98	0.94	170	0.02	-80	0.32	-70	0.93	175
1.99	0.94	169	0.01	-84	0.30	-73	0.94	174
2.00	0.95	169	0.01	-89	0.27	-76	0.95	173

NEL2035F03-24 Z_{in}/Z_{out}

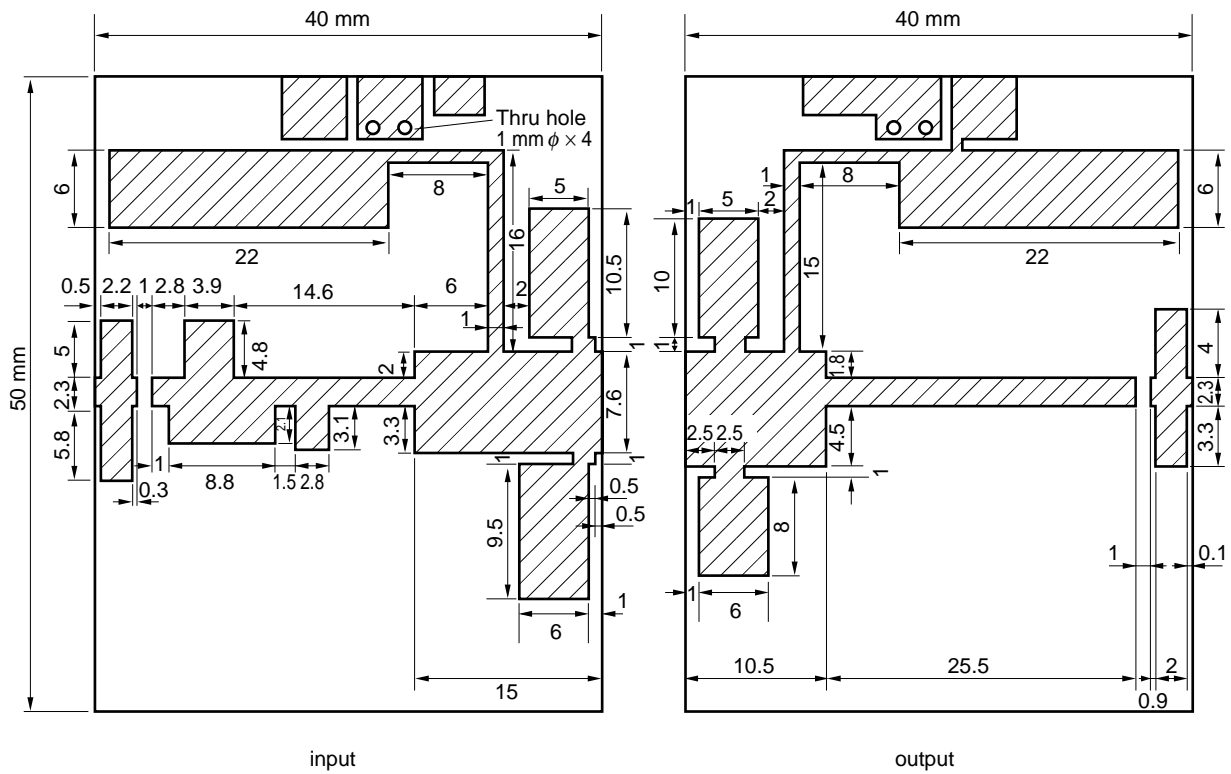


$Z_0 = 50 \text{ ohm}$

f [GHz]	Z_{in} [ohm]	Z_{out} [ohm]
1.80	$2.6 + j8.4$	$4.6 + j5.8$
1.90	$2.3 + j7.0$	$2.0 + j5.2$
1.97	$2.3 + j6.5$	$2.3 + j6.0$
2.00	$1.6 + j5.6$	$1.3 + j6.2$



Circuit Drawing

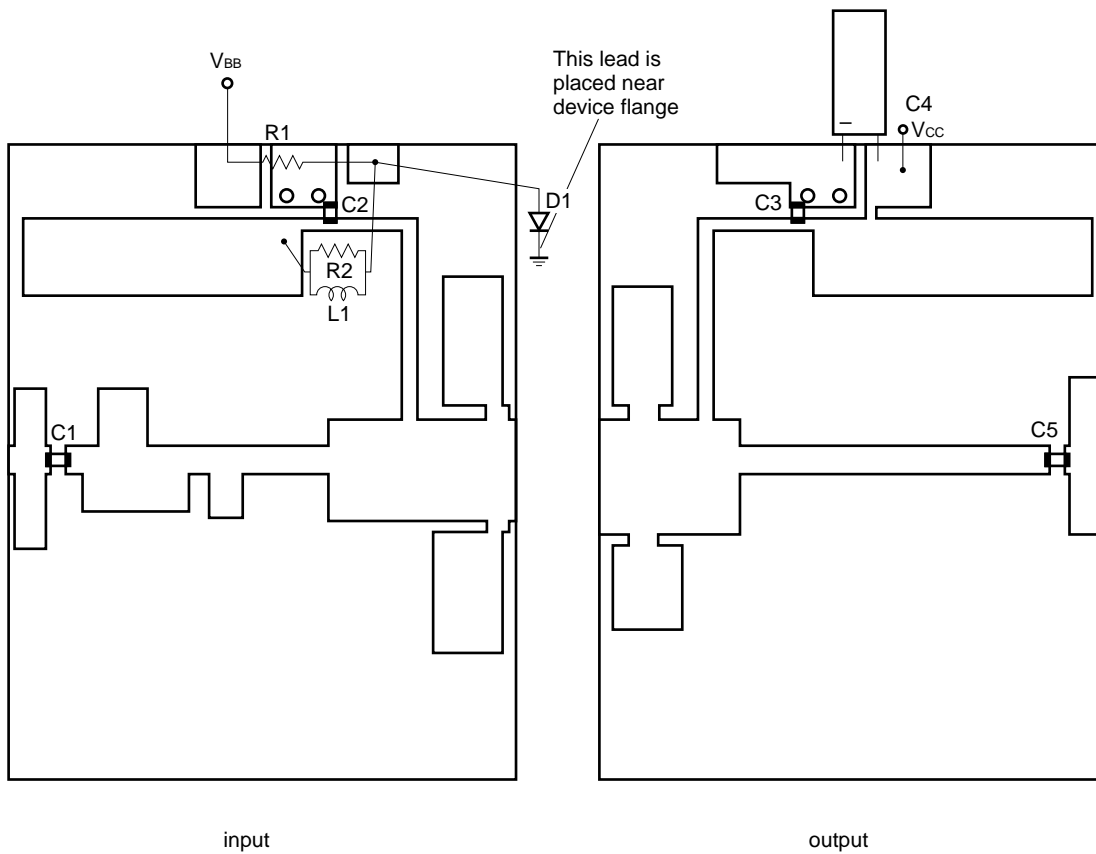


SUBSTRATE (TEFLON)

DICLAD522T®

THICKNESS = 0.79 mm
DOUBLE SIDE 35 μ m Cu
 $\epsilon_r = 2.60$

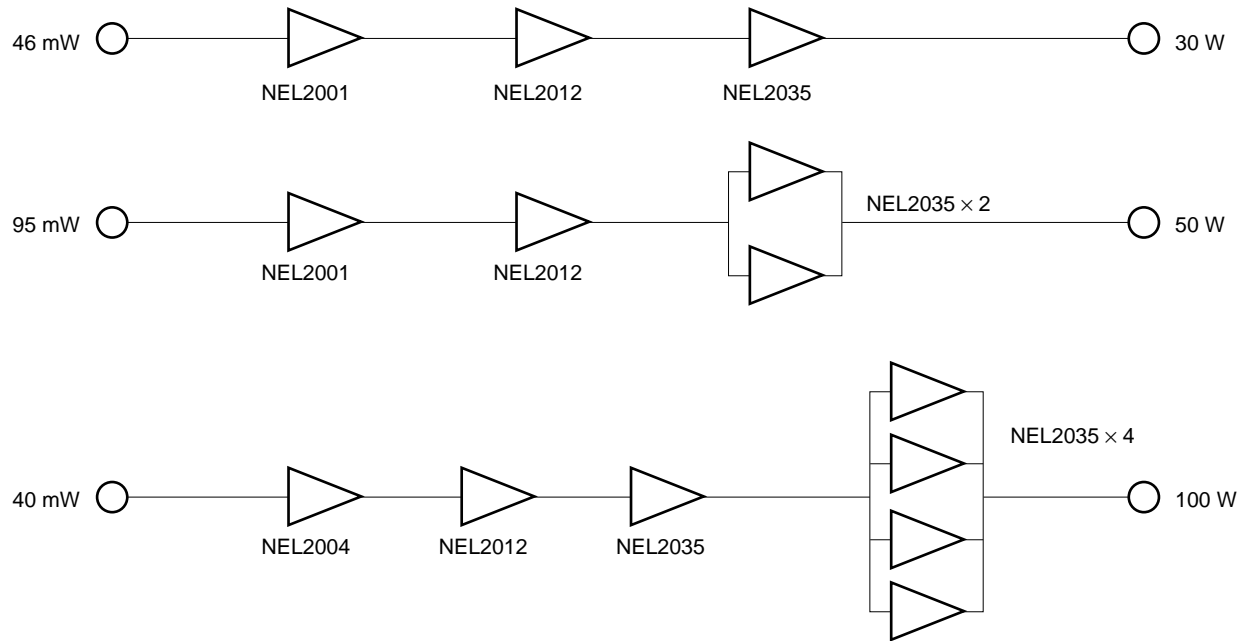
Components Layout



R1: 5.1 Ω
 R2: 30 Ω
 L1 : 5 mm ϕ 10T
 C1, C2, C3, C5: MURATA 47 pF
 C4: 22 μ F (50 V)
 Electrolytic Capacitor
 D1: V06C

APPLICATION

= Amplifier Diagrams =



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Anti-radioactive design is not implemented in this product.